

## El Niño Bulletin #6

May 10, 2003

### Highlights:

- The El Niño event has decayed.
- Drier-than-normal conditions have persisted across southwestern regions of the subcontinent throughout the 2002-2003 growing season.
- Conversely, wet conditions have persisted across large portions of the subcontinent since January 2003.
- Erratic rainfall, both in dry or wet regions, will likely contribute to yield deficiencies.
- The onset of the dry season by 20 April will limit humidity-induced crop losses.
- WFP's prediction for the 2002-03 growing season is that over most parts of the EMOP region, rainfed cereal yields can be expected to be reasonable.
- Emergency food assistance may be necessary in limited areas, albeit at scales very much reduced from those of 2002.

*This final edition of the Bulletin contains an update of the state of the current El Niño event and its impact on seasonal rainfall, examines the growing season's rainfall accumulation coupled with its distribution, and offers the final forecast of yield potentials for maize, sorghum, and pearl millet.*

### Current El Niño Conditions

The El Niño episode has ended. Conditions, both in the Pacific Ocean and the overlying atmosphere, are reverting to normal (Figure 1). Based on the recent evolution of conditions in the tropical Pacific and on the latest coupled model and statistical model forecasts, near-normal conditions are expected to prevail in the tropical Pacific through September 2003.<sup>1</sup>

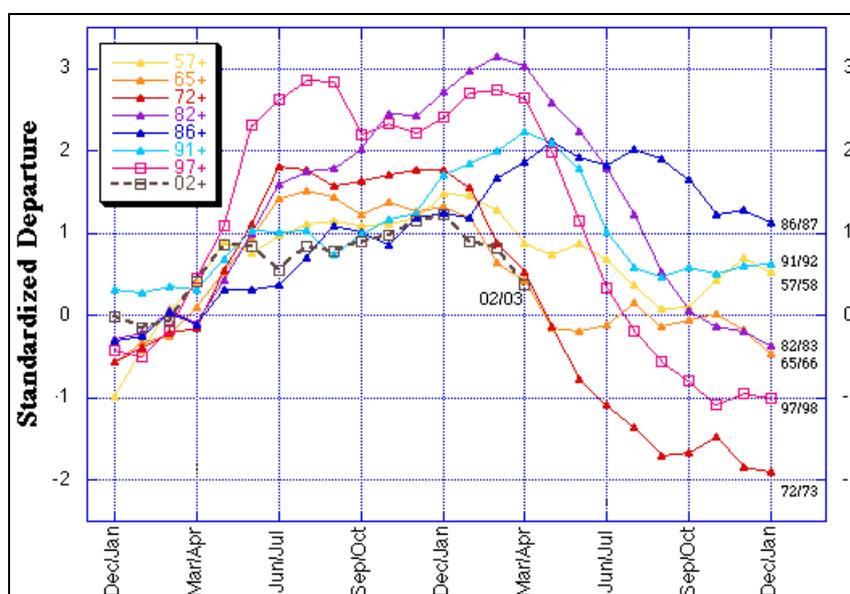


Figure 1. A comparison of the current El Niño event (keyed 02+) with the seven strongest events since 1950. The data points conform to a “multivariate ENSO index,” consisting of a weighted average of the following six variables: sea-level pressure, the east-west and north-south components of the surface wind, sea-surface and surface air temperatures, and total amount of cloudiness.<sup>2</sup>

<sup>1</sup> [http://www.cpc.ncep.noaa.gov/products/analysis\\_monitoring/bulletin/forecast.html](http://www.cpc.ncep.noaa.gov/products/analysis_monitoring/bulletin/forecast.html)

<sup>2</sup> [http://www.cdc.noaa.gov/ENSO/enso.mei\\_index.html](http://www.cdc.noaa.gov/ENSO/enso.mei_index.html)

**Growing Season Rainfall: August 2002 – March 2003**

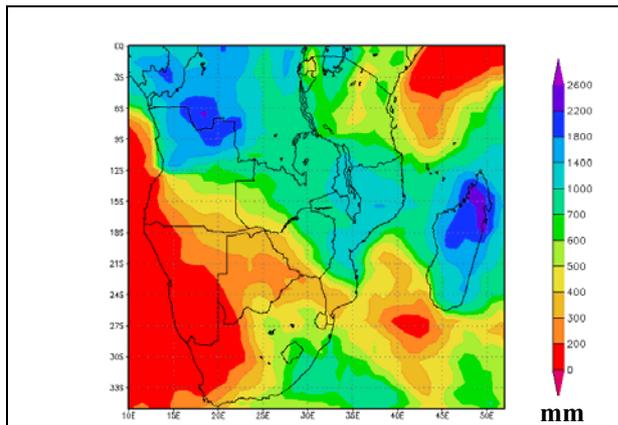


Figure 2a. August 2002 – March 2003 rainfall **accumulations** derived from microwave and infrared satellites, and corrected by ground-level observations. Source: NASA-GES DAAC.

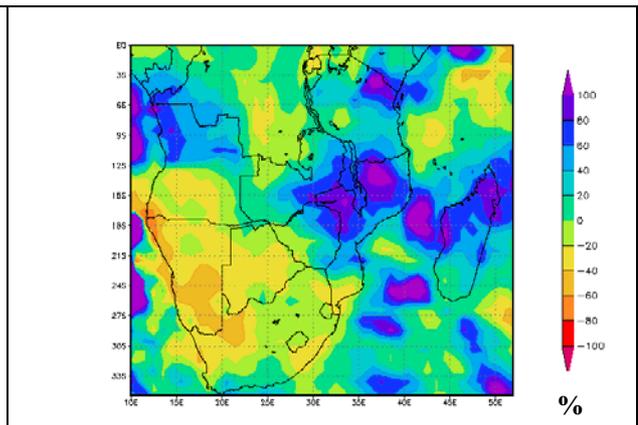


Figure 2b. August 2002 – March 2003 rainfall **departures** compared to the same months in 2001-2002, i.e., normalized to show growing-season percent difference. Source: NASA-GES DAAC.

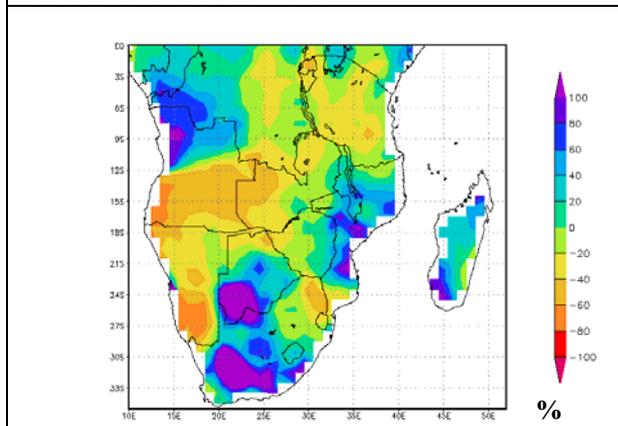


Figure 2c. Comparison of August – March rainfall **departures** with the same months during the 1992 El Niño event, i.e., normalized to show (2002/03–1986/87) percent difference. Source: NASA-GES DAAC.

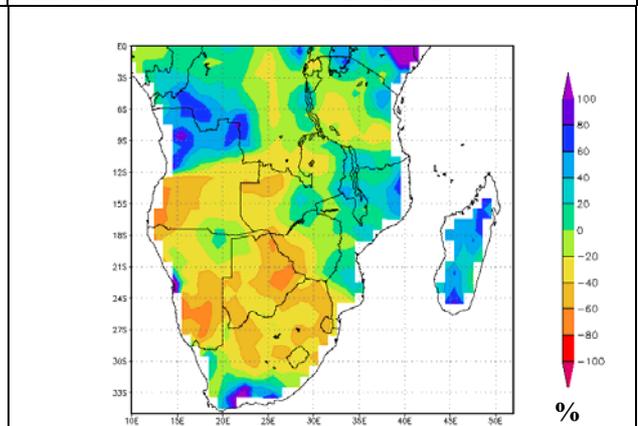


Figure 2d. Comparison of August – March rainfall **departures** with the same months during the 1987 El Niño event, i.e., normalized to show (2002/03–1986/87) percent difference. Source: NASA-GES DAAC.

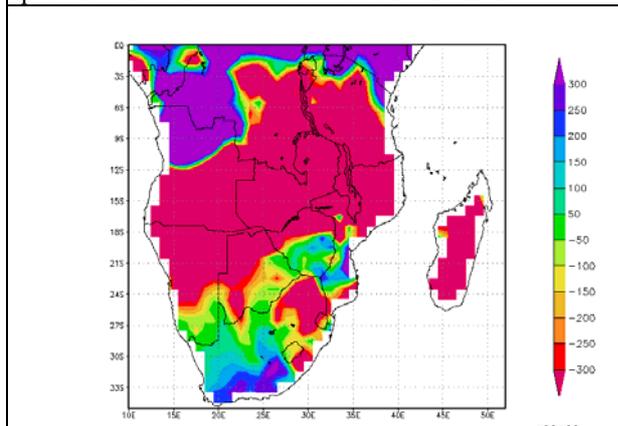


Figure 2e. Comparison of August – March rainfall **accumulations** with “normal” climate, i.e., the same months 1950-1999 that were *not* influenced by either El Niño or La Niña events. Source: NASA-GES DAAC.

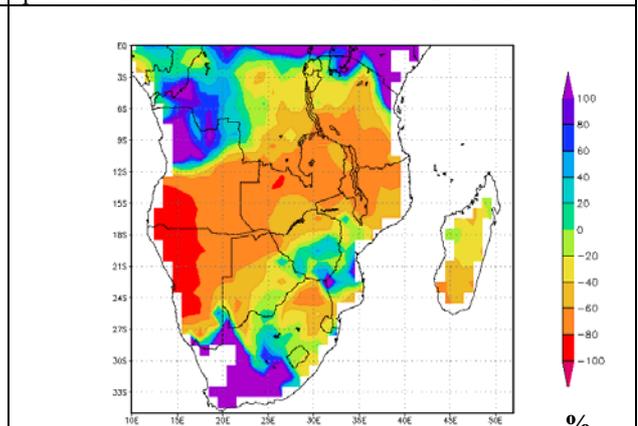


Figure 2f. August – March rainfall **departures**: [(rainfall Aug 2002-Mar 2003) – (mean rainfall Aug-Mar 1950-1999, non-El Niño/La Niña months)]. Source: NASA-GES DAAC.

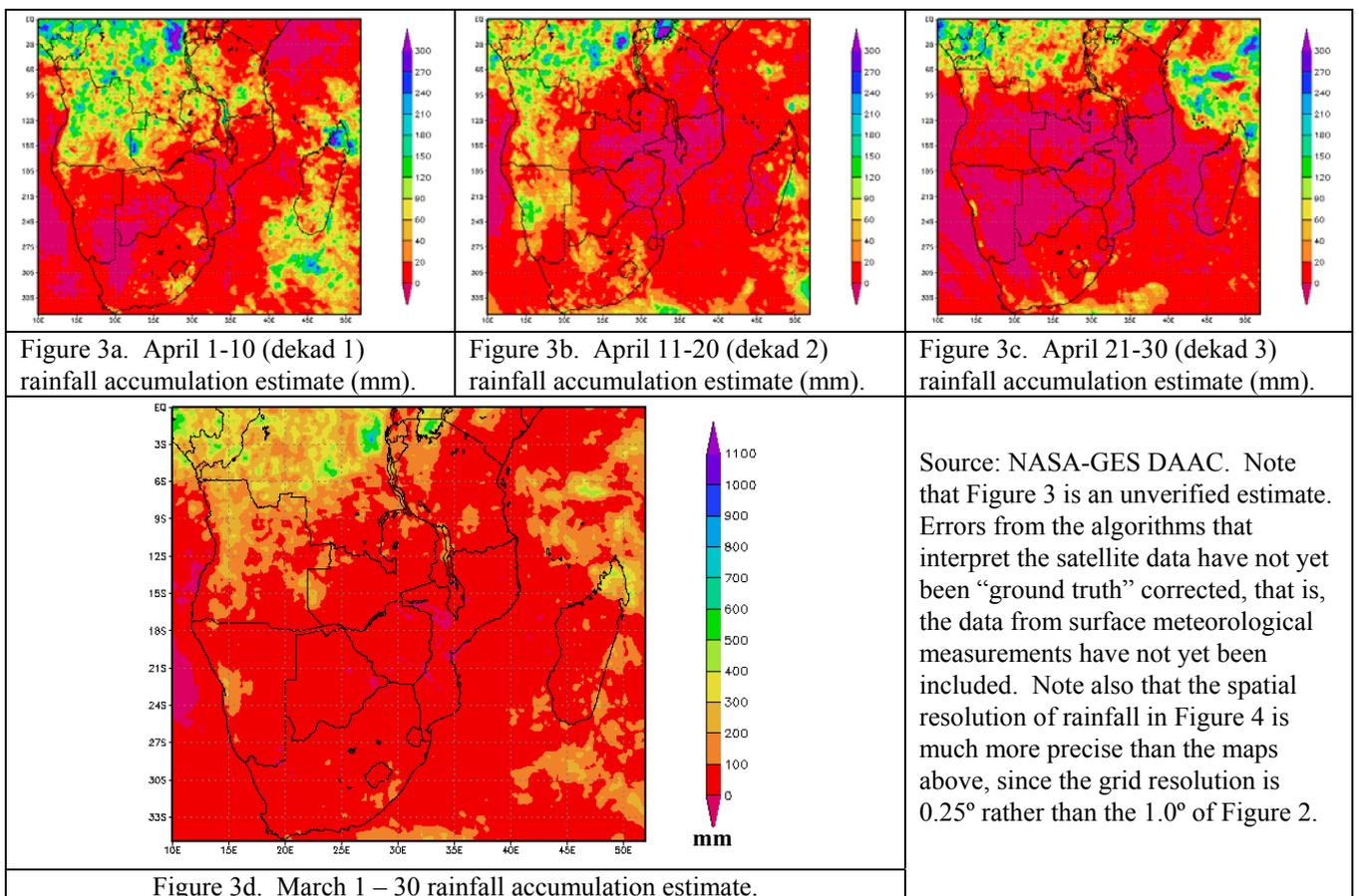
Figure 2a shows dry conditions to have prevailed during the 2002-03 growing season only across southwestern regions of the sub-continent. Significantly, relatively moist conditions were common in

the cyclone-affected regions of northern and central Mozambique, Malawi, eastern Zimbabwe, and eastern and central Zambia. However, across portions of southern Africa, including southwestern Zimbabwe, Namibia, Botswana, southern Angola, Lesotho, Swaziland, and much of South Africa, the growing season was drier than during 2001, a notably “dry” year, as Figure 2b depicts. The 2002-03 comparisons to the 1992-93 and 1986-87 El Niño events are shown in Figures 2c and 2d.

The extent of the current rainfall deficit can best be seen in Figures 2e (absolute difference compared to “normal”) and 2f (percent difference compared to “normal”). Rainfall across much of the subcontinent has been lower than the climatological mean, notably in a southwest-northeast oriented band from Namibia-southern Angola to Tanzania-northern Mozambique and including Madagascar, despite the moist conditions that prevailed in the eastern portion of the continent as a consequence of the rain brought by three tropical cyclones since late December 2002.

**April 2003 Preliminary Estimates: Arrival of the Dry Season**

Rainfall accumulation estimates for March dekads are shown in Figures 3a-3c, and for the full month in Figure 3d. While rainfall continued over the northern reaches of the region during Dekad 1, especially in Zambia and Angola, the dry season had begun by Dekad 2, and was firmly established by Dekad 3.



## Rainfall Distribution Estimates

The season, and associated cropping activities, start in the south and move gradually north. In a normal season, planting should begin in South Africa, Swaziland and Lesotho in October, and in northern Mozambique and Malawi in December.<sup>3</sup> Figure 4 uses this information to compute rainfall dispersion during a 4-month (12 dekad) growing season by means of the Gini coefficient. If rainfall was dispersed absolutely regularly across the 12 dekads, the coefficient = 0; conversely, if rainfall was dispersed completely irregularly, the coefficient = 1. In Figure 4, areas with particularly high Ginis are bounded by a white ellipse, and associated with a daily time-series of rainfall.

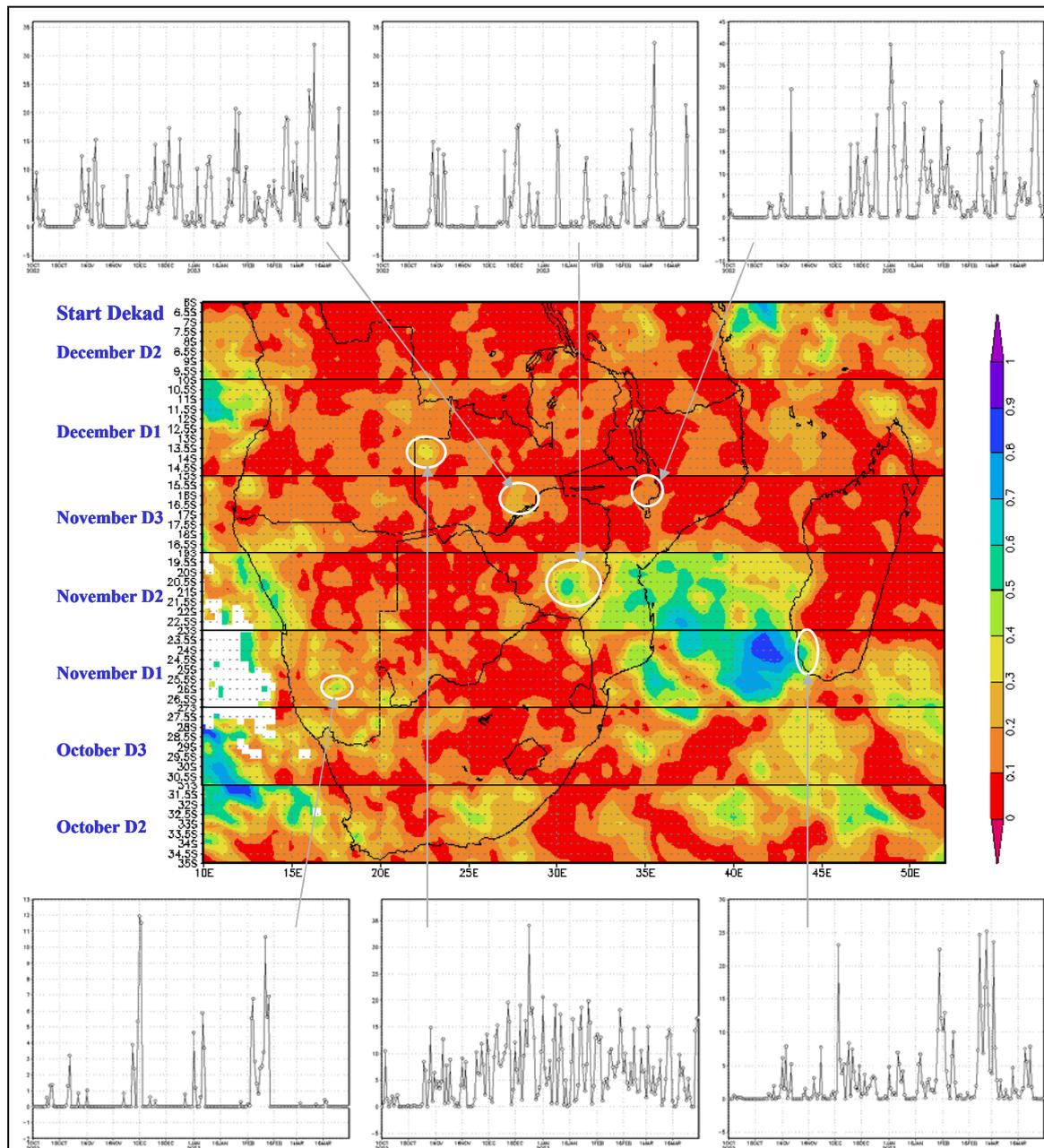


Figure 4. Gini coefficients of dekadal rainfall during a 12-dekad (4 month) maize growing season. If the Gini is 0.0, then rainfall distribution was wholly equal; conversely, if the Gini is 1.0, rainfall distribution was totally unequal. The Gini scale is linear. Daily time-series of rainfall are shown for discrete areas with relatively high Ginis. Source: NASA-GES DAAC.

<sup>3</sup> <http://www.sarpn.org.za/documents/d0000155/index.php>

Figure 5 is an amalgam of rainfall accumulation and the Gini coefficient. One component is the z-score of August 2002-March 2003 rainfall accumulation calculated against the same months of “normal” (i.e., non-El Niño, non-La Niña) years from 1950-1999.<sup>4</sup> A negative z-score indicates drier-than-average conditions, while a positive score indicates the reverse. The more negative the z-score, the drier the conditions as compared to normal, while high positive z-scores are associated with much wetter than normal conditions. Multiplying the z-score by the Gini coefficient gives a product that shows both relative wetness and dispersion.

Recall from above that Gini = 0.0 implies total equality of dispersion, while Gini = 1.0 implies total inequality in dispersion. Thus, the driest and most irregular distribution conditions will calculate as large negative values of the product; dry but regular conditions will calculate as small negative values. And wetter-than-normal conditions will similarly calculate as small positive (wet and regular) or large positive (wet and irregular) values of the product.

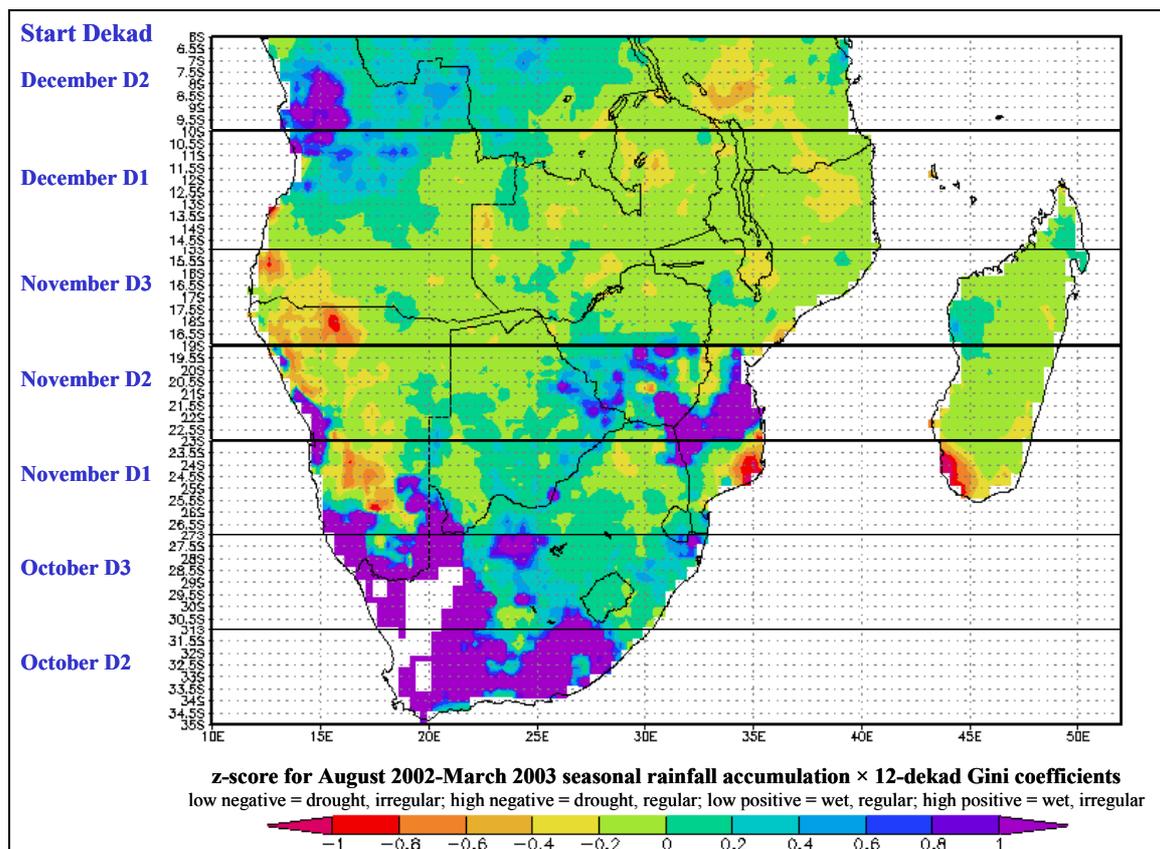


Figure 5. August 2002 – March 2003 monthly accumulated rainfall z-score departures from “normal” (non El Niño, non-La Niña) years, 1950-1999, multiplied by the Gini coefficient of Figure 4 above. Source: NASA-GES DAAC.

Note from Figure 5 that southernmost Madagascar has had exceptionally dry and irregular rainfall conditions as compared to normal (Figure 4 shows the daily time series for this area). Indeed, WFP has commenced emergency assistance to be rendered to people in this area, who have started an internal migration in search of food.<sup>5</sup> Part of coastal southern Mozambique also appears affected in this way. Conversely, just to the north of this dry area in Mozambique, conditions were very much wetter and more irregular than normal.

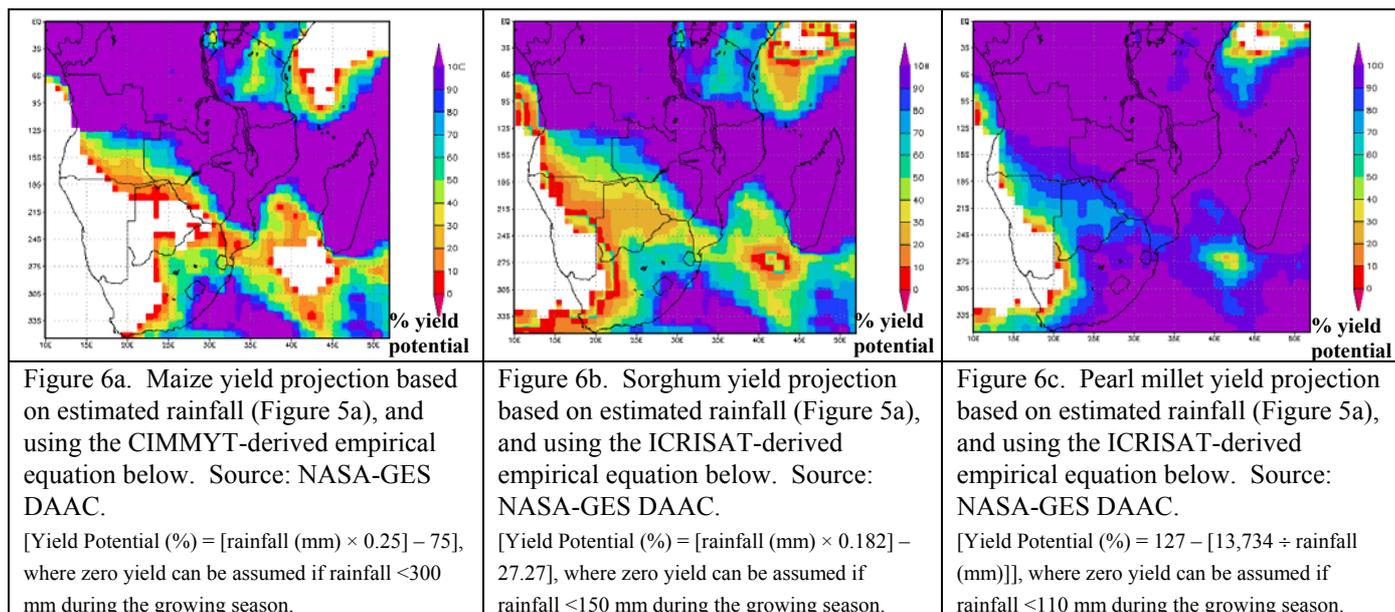
This newly evolved technique of measuring rainfall accumulation and coupling it with dispersion will be used in future years for real-time monitoring of the growing season.

<sup>4</sup> The z-score shows how far this past growing season has departed from the average of all “normal” years, in terms of these years’ internal standard deviation.

<sup>5</sup> [http://www.wfp.org/newsroom/subsections/preview.asp?content\\_item\\_id=1106&item\\_id=649&section=13](http://www.wfp.org/newsroom/subsections/preview.asp?content_item_id=1106&item_id=649&section=13)

## Crop Forecasts for the 2003 April-May Maize and July-August Sorghum-Millet Harvests

Using the August-March rainfall accumulation and simple empirical relationships provided by international crops research institutes, cereal yield estimates as yield potential can be derived. “Yield potential” is expressed in percent, where 100% refers to no expected reduction in yield due to rainfall deficits. Maize yield potential is shown in Figure 6a, which shows expected yield declines in southwestern Zambia, southwestern Zimbabwe, southern Mozambique, and most of Swaziland. Little rainfed maize can be expected in either Botswana or Namibia this year. A band across the southernmost maize zone in Angola can expect reduced maize yields. Using the identical technique but different yield potential equations, the yield potential for sorghum (Figure 6b) and pearl millet (Figure 6c) is also predicted.



The above predictions are based on a single parameter, rainfall and its empirical relationship to yield, and should be considered as experimental. More-sophisticated crop forecast/crop water use models, such as those produced by FAO, incorporate evapotranspiration and soil type parameters.

In view of the continued drought and erratic rainfall in some parts of the subcontinent, and the effects of the three cyclones coupled with erratic rainfall over others, **WFP expects the need for limited emergency food assistance to continue during 2003, albeit at very much reduced levels as compared to 2002.**

Questions may be directed to the author of this report via email, [Lenard.Milich@WFP.org](mailto:Lenard.Milich@WFP.org). This is the final Bulletin for this year.